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# Overview

The Institute for Telecommunication Sciences (ITS), located in Boulder, Colorado, is the research and engineering arm of the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce. The Institute's staff, all of whom are Federal employees, provide strong engineering and scientific skills and experience to our technical programs. The majority of our employees are electronics engineers, but the staff also includes mathematicians, physicists, computer scientists, and specialists in other fields. ITS' support during Fiscal Year 2004 consisted of \$6 million of direct funding from the Department of Commerce and approximately \$8 million for work sponsored by other Federal agencies and U.S. industry.

## History

ITS began in the 1940s as the Interservice Radio Propagation Laboratory, which after the war became the Central Radio Propagation Laboratory (CRPL) of the National Bureau of Standards, U.S. Department of Commerce. A new facility was built for CRPL in Boulder, Colorado, and dedicated by President Eisenhower in September, 1954.

In 1965, CRPL joined the Environmental Science Services Administration (ESSA) and was renamed the Institute for Telecommunication Sciences and Aeronomy (ITSA). In 1967, ITSA split into two labs: the Aeronomy Laboratory and the Institute for Telecommunication Sciences (ITS).

In 1970, Executive Order 11556 established the Office of Telecommunications (OT) within the Department of Commerce and the Office of Telecommunications Policy (OTP) in the Executive Office of the President; at the same time, ITS was transferred from ESSA to OT. Under the President's Reorganization Act #1 of 1977, OT and OTP merged to form NTIA.

Since 1978, ITS has performed telecommunication research and provided technical engineering support to NTIA, and to other Federal agencies on a reimbursable basis. Over the last 15 years, ITS has pursued cooperative research with U.S. industry under the provisions of the Federal Technology Transfer Act of 1986. In 2004, ITS joined with NIST and NOAA to celebrate 50 years in Boulder.

## Our Expertise

- **Radio Research Fundamentals and Spectrum Measurement:** ITS measures emission characteristics of Federal transmitter systems, and identifies and resolves radio frequency interference. We incorporate remote sensing data into our signal propagation models, and explore advanced antenna designs.
- **Communication Systems and Networks:** ITS plans, implements, and evaluates telecommunication systems. As part of our commitment to interoperable communications in public safety, we facilitate interconnectivity and interoperability between services and technologies.
- **Standards Development:** ITS has a long record of leadership and technical contributions to telecommunication standards committees.
- **Wireless Voice/Data Systems and Emerging Technologies:** ITS assesses telecommunications system components, evaluates network survivability, and assesses system effectiveness in NS/EP, military, and commercial environments. We test emerging technologies, e.g., VoIP and UWB.
- **Audio and Video Quality Research:** For over 15 years, ITS has conducted research on digital audio and video quality, grounded in signal processing theory and models of perception.
- **Electromagnetic Modeling & Analysis:** ITS maintains ongoing investigations in broadband wireless systems performance, advanced antenna designs, and noise as a limiting factor for advanced communication systems.

## Our Facilities

The Institute's world-class facilities include:

- **Audio-Visual Laboratories**
- **Interoperability Research Laboratory**
- **Radio Spectrum Measurement System (RSMS)**
- **Secure Internet (SIPRNET)**
- **Table Mountain Field Site/Radio Quiet Zone**
- **Telecommunications Analysis Services**
- **Wireless Networks Research Center**

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## The Benefits Created by ITS

The Institute's research significantly benefits both the public and private sectors in several areas:

- **Spectrum Utilization:** Optimization of Federal spectrum allocation methods, identification of unused frequencies and potential interference through field measurements, and promotion of technology advances to aid in efficient use of the spectrum.
- **Telecommunications Negotiations:** Expert technical leadership at international conferences and development of negotiation support tools such as interference prediction programs.
- **Public Safety:** Systems engineering, planning, and testing of interoperable radio systems (e.g., voice, video, and data) for the use of "first responders" at the Federal, State, local, and tribal levels.
- **National Defense:** Improvement of network operation and management, enhancement of survivability, expansion of network interconnections and interoperability, and improvement of emergency communications that contribute to the strength and cost-effectiveness of the U.S. Armed Forces.
- **Domestic Competition:** Development of user-oriented, technology-independent methods of measuring telecommunications performance to give users a practical way of comparing competing equipment and services.
- **International Trade:** Promulgation of international telecommunications standards to remove technical barriers to U.S. export of telecommunications equipment and services.
- **Technology Transfer:** Direct transfer of research results and measurements to U.S. industry and Government to support national and international competitiveness, bring new technology to users, and expand the capabilities of national and global telecommunications infrastructures.

## Our Organization

The Institute's technical activities are organized into four program areas:

- **Spectrum and Propagation Measurements**
- **Telecommunications and Information Technology Planning**
- **Telecommunications Engineering, Analysis, and Modeling**
- **Telecommunications Theory**

ITS's research and engineering work is supported by the Director's Office, which provides support to the program, budget, and administrative functions of the Institute. ITS also maintains an NTIA liaison function to provide assistance to NTIA on participation in national and international conferences and negotiations. The liaison also coordinates the laboratory's technical research with other Federal agencies.

## Our Sponsors

Activities at the Institute are undertaken through a combination of programs sponsored by the Department of Commerce and other Federal agencies, and through cooperative research agreements with the private sector. The Institute's policy stipulates that research sponsored by other agencies must contribute to and reinforce NTIA's overall program and must be directed toward supporting the goals of the Department of Commerce. Major other agency sponsors include the National Institute of Standards and Technology's Office of Law Enforcement Standards, the Department of Homeland Security, the Department of Transportation, the National Weather Service, and the U.S. Coast Guard.

Cooperative research and development agreements (CRADAs) with telecommunication-operating companies and manufacturers support technology transfer and commercialization of telecommunications products and services, which are major goals of the Department of Commerce. ITS has CRADAs with large established companies as well as small, start-up companies. Partnerships such as these enhance synergies between entrepreneurial ventures and broad national goals.

Because of its centralized Federal role, ITS can provide a cost-effective, expert resource that supports many Federal agencies and industry organizations. ITS provides research and engineering that is critical to continued U.S. leadership in providing telecommunications and information equipment and services. This Progress Report summarizes technical contributions made by ITS during Fiscal Year 2004 to both the public and private sectors.